

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **KOLELEMOOK LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *slightly improving* in-lake chlorophyll-a trend, meaning concentrations are decreasing. Algal abundance was slightly higher this season, but chlorophyll-a concentrations have remained well below the NH mean value for over ten years! While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *slightly improving* trend in lake transparency. Transparency in June likely decreased due to the heavy rainfall the day before. Heavy rainfall results in tributary turbidity that can influence transparency. Water clarity was back to normal in July and August, and has also remained above the NH average for over ten years! The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.
- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters.

Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stabilizing* trend for in-lake phosphorus levels. Phosphorus concentrations in the hypolimnion were consistent with previous years, and have remained below the NH median reference line. Epi limnetic phosphorus concentrations were elevated in August. The turbidity of the sample could have raised the phosphorus content and therefore, yielded inaccurate results. Only two samples were collected for the in-lake station this summer. *Please be sure to include the early season in-lake sampling as part of the program. Collecting in-lake samples in June allows us to observe how spring runoff has affected the lake quality.* One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Conductivity decreased from the high values of last season (Table 6). This leads us to believe that the dry weather in 1999 caused pollutants to accumulate in the watershed instead of being flushed out. Conductivity increases often indicate the influence of human activities on surface waters. This decrease is a positive sign for the lake. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity.
- Inlet turbidity was greatly reduced this year (Table 11), as was the phosphorus (Table 8). The wet weather increased the stream flow and allowed a clean sample to be taken. The Inlet has not experienced this low phosphorus result since 1995. We will watch for this trend to continue.
- Dissolved oxygen was high throughout the water column (Table 9). Shallow ponds tend to mix continuously through wind and wave action, thereby allowing for oxygen exchange with the atmosphere.

NOTES

- Monitor's Note (6/18/00): Heavy rain day before.
- Monitor's Note (7/5/00): Very windy, drifted a lot while sampling.

USEFUL RESOURCES

Low Impact Boating, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Aquatic Plants and Their Role in Lake Ecology, WD-BB-44, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

The Lake and Reservoir Restoration Guidance Manual, First Edition. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

What Can You Do to Prevent Shoreland Erosion?, WD-BB-30, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Phosphorus in Lakes, WD-BB-20, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

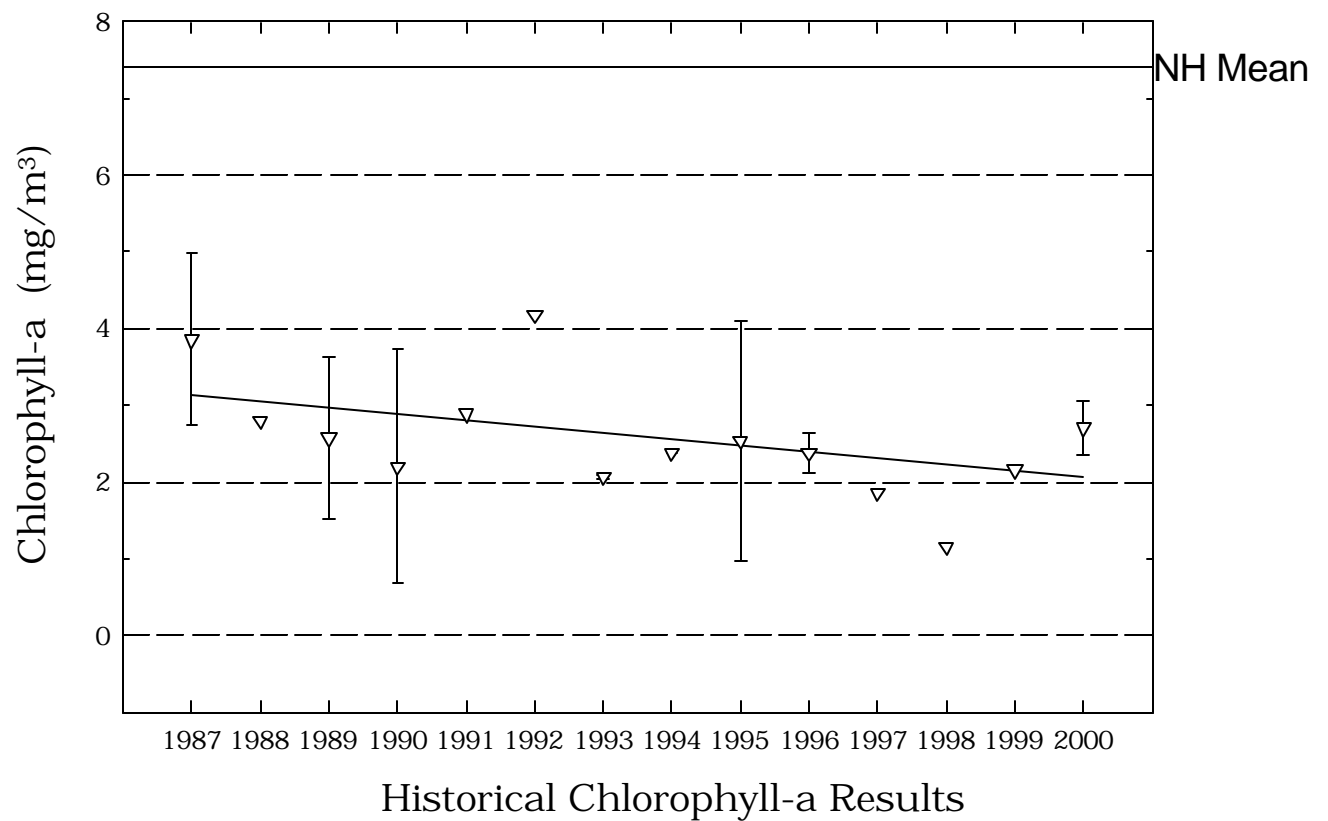
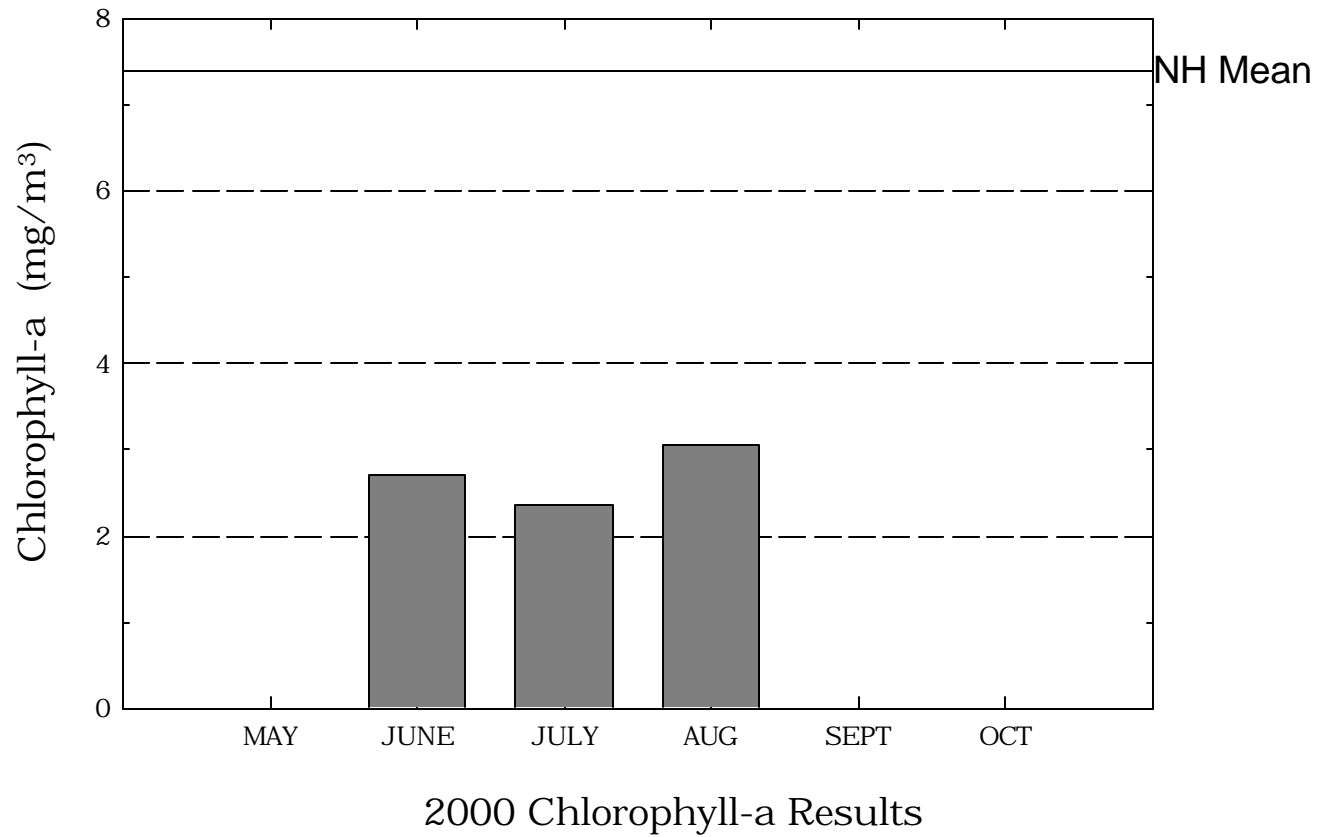
Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

The Lake Pocket Book, The Terrene Institute, 2000. (800) 726-5253, or www.terrene.org

Diet for a Small Lake: A New Yorker's Guide to Lake Management. Federation of Lake Associations, Cazenovia, NY, 1990. (800) 796-FOLA, or www.nysfola.org

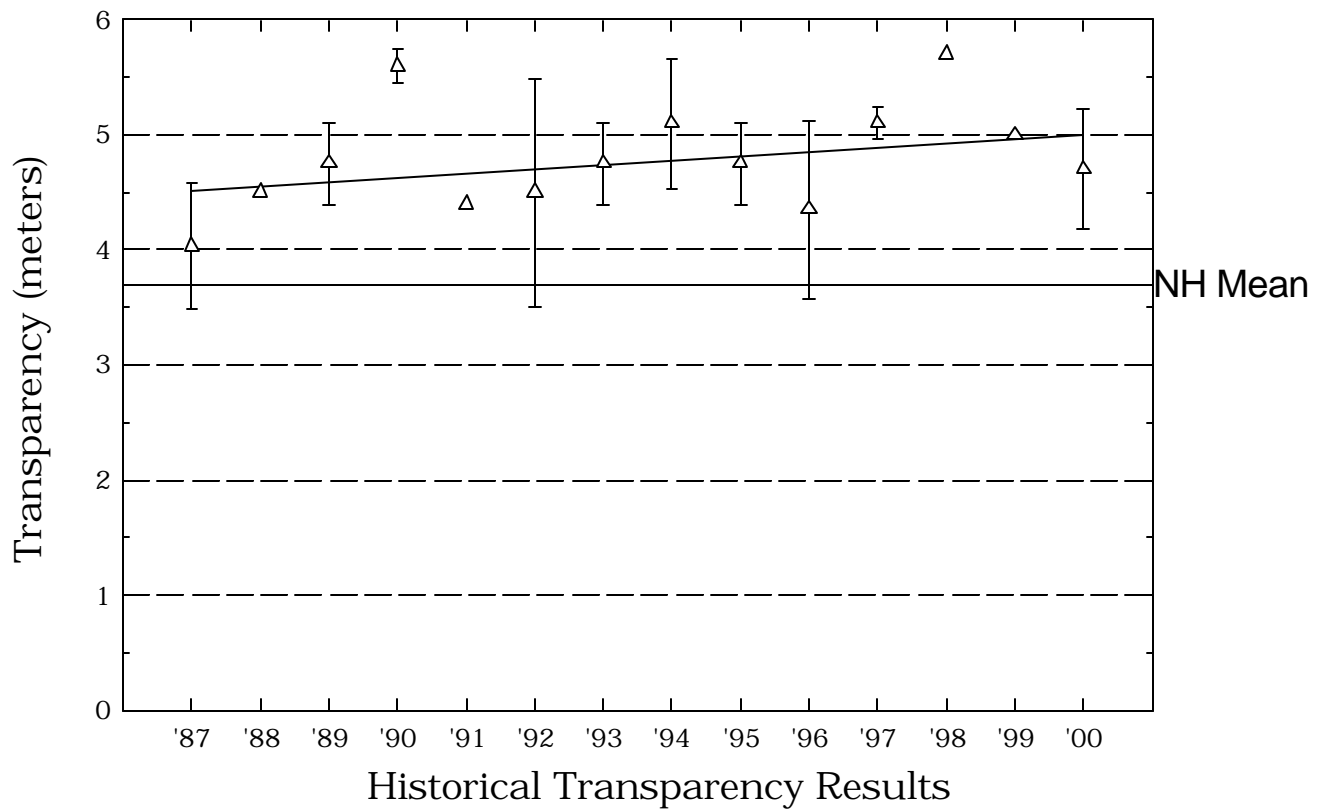
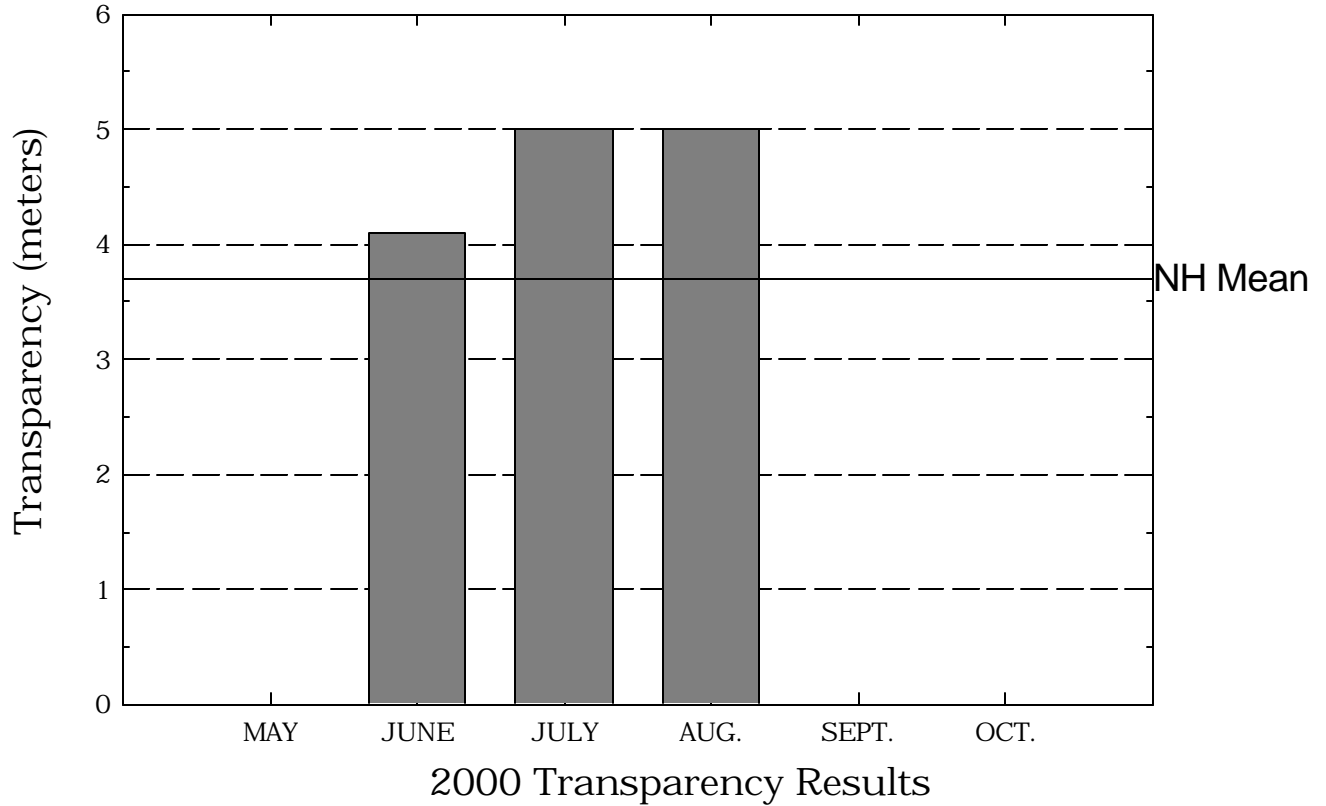
Kolelemook Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



Kolelemook Lake

Figure 2. Monthly and Historical Transparency Results



Kolelemook Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

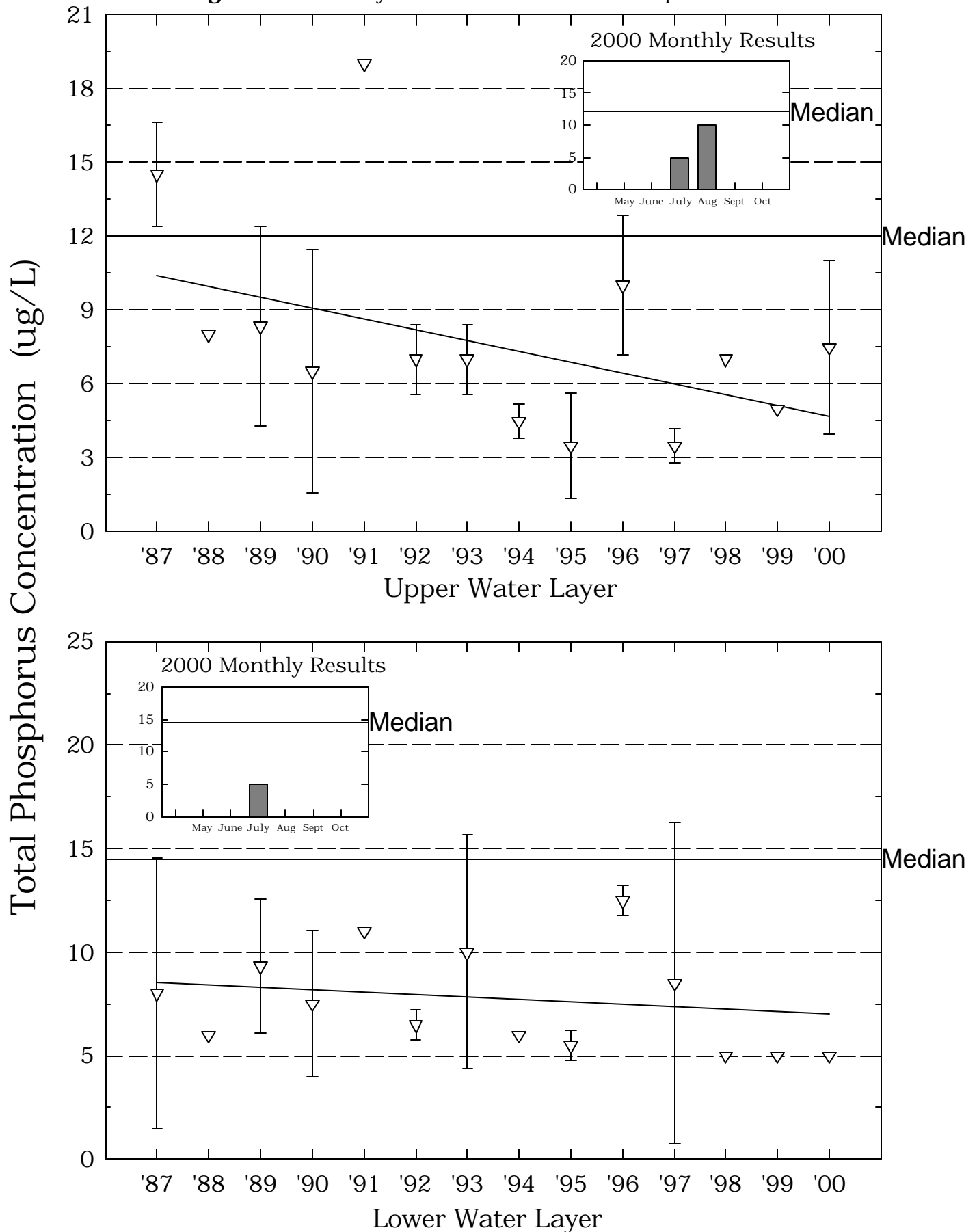


Table 1.**KOLELEMOOK LAKE
SPRINGFIELD****Chlorophyll-a results (mg/m³) for current year and historical
sampling periods.**

Year	Minimum	Maximum	Mean
1987	2.93	5.10	3.85
1988	2.80	2.80	2.80
1989	1.83	3.32	2.57
1990	1.13	3.28	2.20
1991	2.89	2.89	2.89
1992	4.17	4.17	4.17
1993	1.99	2.08	2.03
1994	2.37	2.39	2.38
1995	1.42	3.65	2.53
1996	2.20	2.94	2.56
1997	1.85	1.85	1.85
1998	1.15	1.15	1.15
1999	2.16	2.16	2.16
2000	2.35	3.06	2.70

Table 2.

**KOLELEMOOK LAKE
SPRINGFIELD**

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06/08/1987	TABELLARIA	42
	MELOSIRA	24
	DINOBRYON	15
08/03/1990	RHIZOSOLENIA	31
	MELOSIA	15
	DINOBRYON	24
07/30/1991	CHRYSOSPHAERELLA	70
	RHIZOSOLENIA	11
	MELOSIRA	10
06/09/1992	ASTERIONELLA	43
	DINOBRYON	36
	RHIZOSOLENIA	16
08/18/1993	ASTERIONELLA	66
	RHIZOSOLENIA	21
08/05/1994	TABELLARIA	86
	SYNEDRA	10
07/28/1995	CHRYSOSPHAERELLA	53
	DINOBRYON	21
	RHIZOSOLENIA	8
06/25/1996	DINOBRYON	40
	MELOSIRA	30
	ANABAENA	15
08/05/1996	ASTERIONELLA	64
	TABELLARIA	18
	DINOBRYON	10
07/11/1997	TABELLARIA	74
	MELOSIRA	16
	ASTERIONELLA	3
08/06/1998	TABELLARIA	71
	OOCYSTIS	24
	ASTERIONELLA	2

Table 2.

**KOLELEMOOK LAKE
SPRINGFIELD**

**Phytoplankton species and relative percent abundance.
Summary for current and historical sampling seasons.**

Date of Sample	Species Observed	Relative % Abundance
07/08/1999	ASTERIONELLA	55
	CHRYSOSPHAERELLA	31
	TABELLARIA	3
07/05/2000	DINOBRYON	31
	ASTERIONELLA	33
	TABELLARIA	18

Table 3.**KOLELEMOOK LAKE
SPRINGFIELD****Summary of current and historical Secchi Disk
transparency results (in meters).**

Year	Minimum	Maximum	Mean
1987	3.5	4.6	4.0
1988	4.5	4.5	4.5
1989	4.5	5.0	4.7
1990	5.5	5.7	5.6
1991	4.4	4.4	4.4
1992	3.8	5.2	4.5
1993	4.5	5.5	5.0
1994	4.7	5.5	5.1
1995	4.5	5.0	4.7
1996	3.8	5.0	4.5
1997	5.0	5.2	5.1
1998	5.7	5.7	5.7
1999	5.0	5.0	5.0
2000	4.1	5.0	4.7

Table 4.

**KOLELEMOOK LAKE
SPRINGFIELD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
EPILIMNION	1987	6.95	7.00	6.97
	1988	6.93	6.93	6.93
	1989	6.81	7.07	6.94
	1990	6.84	7.06	6.94
	1991	7.10	7.10	7.10
	1992	6.55	7.13	6.75
	1993	6.60	6.93	6.78
	1994	6.80	6.90	6.85
	1995	6.74	7.04	6.86
	1996	6.44	6.84	6.60
	1997	6.86	6.86	6.86
	1998	6.91	6.91	6.91
	1999	6.74	6.74	6.74
	2000	6.45	6.86	6.61
HYPOLIMNION	1987	6.93	7.04	6.99
	1988	6.67	6.67	6.67
	1989	6.78	6.97	6.89
	1990	6.70	7.12	6.86
	1991	7.30	7.30	7.30
	1992	6.50	7.01	6.68
	1993	6.75	6.89	6.81
	1994	6.76	6.81	6.78
	1995	6.73	6.89	6.80
	1996	6.24	6.71	6.40
	1997	6.79	6.79	6.79

Table 4.

**KOLELEMOOK LAKE
SPRINGFIELD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
INLET	1998	6.84	6.84	6.84
	1999	6.64	6.64	6.64
	2000	6.88	6.88	6.88
INLET	1987	6.86	6.86	6.86
	1989	6.34	6.34	6.34
	1990	6.30	6.76	6.47
	1992	6.40	6.40	6.40
	1993	6.07	6.07	6.07
	1995	6.19	6.19	6.19
	1998	6.33	6.33	6.33
	1999	6.32	6.32	6.32
	2000	6.27	6.28	6.27
JASPERS	1993	6.65	6.66	6.65
METALIMNION	1996	6.54	6.54	6.54
OUTLET	1987	6.96	7.05	7.00
	1989	6.68	7.04	6.88
	1990	7.04	7.04	7.04
	1991	6.90	6.90	6.90
	1992	6.50	7.07	6.70
	1993	6.29	6.29	6.29
	1994	6.81	6.90	6.85

Table 4.

**KOLELEMOOK LAKE
SPRINGFIELD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
	1995	6.73	6.82	6.77
	1996	6.71	6.80	6.75
	1997	6.70	6.78	6.74
	1998	6.81	6.81	6.81
	1999	6.79	6.79	6.79
	2000	6.75	6.80	6.77

Table 5.**KOLELEMOOK LAKE****SPRINGFIELD****Summary of current and historical Acid Neutralizing Capacity.****Values expressed in mg/L as CaCO₃.****Epilimnetic Values**

Year	Minimum	Maximum	Mean
1988	6.50	6.50	6.50
1989	5.30	6.50	5.97
1990	4.30	5.90	5.10
1991	7.20	7.20	7.20
1992	5.80	7.40	6.60
1993	3.80	6.00	4.90
1994	4.00	5.00	4.50
1995	4.50	4.70	4.60
1996	3.80	5.10	4.53
1997	5.00	5.00	5.00
1998	5.20	5.20	5.20
1999	4.70	4.70	4.70
2000	4.80	8.70	6.75

Table 6.

**KOLELEMOOK LAKE
SPRINGFIELD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
EPILIMNION	1987	58.0	61.4	59.7
	1988	63.2	63.2	63.2
	1989	70.9	71.8	71.4
	1990	70.1	70.8	70.4
	1991	75.5	75.5	75.5
	1992	77.6	84.5	81.0
	1993	85.9	91.4	89.5
	1994	85.6	85.6	85.6
	1995	87.5	93.2	90.3
	1996	71.6	76.4	73.7
	1997	75.5	75.5	75.5
	1998	89.9	89.9	89.9
	1999	107.8	107.8	107.8
	2000	84.5	98.3	91.4
HYPOLIMNION	1987	58.6	62.3	60.8
	1988	65.2	65.2	65.2
	1989	70.8	71.6	71.2
	1990	70.6	70.9	70.7
	1991	74.7	74.7	74.7
	1992	77.4	84.0	80.7
	1993	88.2	91.9	90.0
	1994	86.0	86.0	86.0
	1995	85.0	91.7	88.3
	1996	71.4	74.8	73.2

Table 6.

**KOLELEMOOK LAKE
SPRINGFIELD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1997	75.8	75.8	75.8
	1998	90.8	90.8	90.8
	1999	107.5	107.5	107.5
	2000	97.9	97.9	97.9
INLET	1987	67.4	67.4	67.4
	1989	62.6	62.6	62.6
	1990	71.3	73.4	72.3
	1992	255.0	255.0	255.0
	1993	99.7	99.7	99.7
	1995	79.9	79.9	79.9
	1998	105.4	105.4	105.4
	1999	121.7	121.7	121.7
	2000	75.1	92.1	83.6
JASPERS	1993	103.1	329.5	216.3
METALIMNION	1996	72.9	72.9	72.9
OUTLET	1987	57.7	62.8	60.8
	1989	70.3	74.7	72.0
	1990	71.3	72.6	71.9
	1991	74.5	74.5	74.5
	1992	77.5	84.1	80.8
	1993	107.0	107.0	107.0
	1994	86.4	86.4	86.4

Table 6.

**KOLELEMOOK LAKE
SPRINGFIELD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1995	90.0	93.4	91.7
	1996	72.7	77.1	74.9
	1997	75.3	81.5	78.4
	1998	89.1	89.1	89.1
	1999	107.3	107.3	107.3
	2000	96.4	98.2	97.5

Table 8.**KOLELEMOOK LAKE****SPRINGFIELD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
EPILIMNION	1987	13	16	14
	1988	8	8	8
	1989	4	12	8
	1990	3	10	6
	1991	19	19	19
	1992	6	8	7
	1993	3	8	5
	1994	4	5	4
	1995	2	5	3
	1996	8	12	10
	1997	3	4	3
	1998	7	7	7
	1999	5	5	5
	2000	5	10	7
HYPOLIMNION	1987	< 1	14	8
	1988	6	6	6
	1989	7	13	9
	1990	5	10	7
	1991	11	11	11
	1992	6	7	6
	1993	4	14	8
	1994	6	6	6
	1995	5	6	5
	1996	12	13	12

Table 8.**KOLELEMOOK LAKE****SPRINGFIELD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1997	3	14	8
	1998	5	5	5
	1999	5	5	5
	2000	5	5	5
INLET #1				
	1996	11	11	11
INLET #2				
	1996	34	34	34
INLET				
	1987	22	22	22
	1989	14	14	14
	1990	6	18	12
	1992	8	8	8
	1993	14	14	14
	1995	11	11	11
	1998	47	47	47
	1999	31	31	31
	2000	6	18	12
JASPERS				
	1993	16	16	16
METALIMNION				
	1996	12	12	12
OUTLET				
	1987	9	14	12
	1989	2	9	5
	1990	2	15	8

Table 8.**KOLELEMOOK LAKE****SPRINGFIELD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1991	14	14	14
	1992	6	10	8
	1993	12	12	12
	1994	6	7	6
	1995	13	22	17
	1996	8	11	9
	1997	4	5	4
	1998	5	5	5
	1999	5	5	5
	2000	2	7	4

Table 9.
KOLELEMOOK LAKE
SPRINGFIELD

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 5, 2000			
1.0	19.0	7.4	80.0
2.0	22.9	7.4	86.3
3.0	23.0	7.4	86.7
4.0	23.0	7.4	86.7
5.0	23.0	7.4	86.2
6.0	16.9	3.7	37.9

Table 10.

**KOLELEMOOK LAKE
SPRINGFIELD**

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 8, 1987	6.0	14.3	7.4	71.0
June 8, 1989	6.5	13.0	7.0	66.0
August 3, 1990	6.0	22.3	8.0	92.6
July 30, 1991	5.5	22.0	8.2	94.4
June 9, 1992	6.0	12.8	5.4	51.0
August 18, 1993	6.0	21.3	6.9	76.0
August 5, 1994	6.0	24.3	8.1	96.0
July 28, 1995	6.0	21.5	5.2	58.0
June 25, 1996	6.0	14.0	5.6	54.0
August 5, 1996	6.0	19.2	3.3	35.0
July 11, 1997	6.0	21.0	5.7	63.0
August 6, 1998	5.5	21.8	0.5	6.0
July 8, 1999	6.0	23.6	7.5	88.7
July 5, 2000	6.0	16.9	3.7	37.9

Table 11.

**KOLELEMOOK LAKE
SPRINGFIELD**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
EPILIMNION	1993	0.9	1.0	0.9
	1994	0.9	0.9	0.9
	1995	0.7	0.7	0.7
	1996	0.8	0.8	0.8
	1997	0.2	0.2	0.2
	1998	0.2	0.2	0.2
	1999	0.3	0.3	0.3
	2000	0.3	1.6	0.9
HYPOLIMNION	1993	0.6	1.0	0.8
	1994	0.9	0.9	0.9
	1995	0.7	0.7	0.7
	1996	0.9	0.9	0.9
	1997	0.3	0.3	0.3
	1998	0.2	0.2	0.2
	1999	0.3	0.3	0.3
	2000	0.4	0.4	0.4
INLET	1998	2.4	2.4	2.4
	1999	3.2	3.2	3.2
	2000	0.5	0.9	0.7
JASPERS	1993	0.9	0.9	0.9
OUTLET	1994	0.9	0.9	0.9
	1995	3.1	3.1	3.1

Table 11.

**KOLELEMOOK LAKE
SPRINGFIELD**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
	1996	1.0	1.0	1.0
	1997	0.3	1.4	0.8
	1998	0.2	0.2	0.2
	2000	0.3	0.9	0.6